

WHAT IS CLAIMED IS:

1. A semiconductor substrate-supporting apparatus for supporting and heating a semiconductor substrate inside a vacuum-pumped reaction chamber, comprising:

5 a substrate-supporting surface having a concave portion including a depression slanting toward the center of the substrate-supporting surface, wherein only a peripheral portion of the back surface of the substrate, when loaded, contacts the slanting surface of the concave portion;

a heating element; and

10 no mechanical mechanism to clamp the substrate on the substrate-supporting surface.

2. The apparatus as claimed in Claim 1, wherein said slanting surface is a portion of a spherical surface.

15 3. The apparatus as claimed in Claim 1, wherein said slanting surface is a conical surface.

4. The apparatus as claimed in Claim 1, wherein said concave surface comprises a slanting portion and a flat portion.

5. The apparatus as claimed in Claim 1, wherein the distance between the back surface of the substrate and the center of the concave surface is 0.05mm to 0.3mm.

20 6. The apparatus as claimed in Claim 1, wherein the heating element is embedded below said concave portion.

7. The apparatus as claimed in Claim 6, further comprising a radio-frequency electrode of a metal element which is embedded below said concave portion and above said heating element.

25 8. The apparatus as claimed in Claim 1, further comprising a surface peripheral portion formed outside the substrate-supporting surface, said surface peripheral portion having a lip portion which protrudes in a ring shape.

9. The apparatus as claimed in Claim 1, which is adapted to be installed in a plasma CVD apparatus.

30 10. A plasma CVD apparatus, comprising:

a vacuum-pumped reaction chamber;

a semiconductor substrate-supporting apparatus for supporting and heating a semiconductor substrate inside the vacuum-pumped reaction chamber, said substrate-supporting apparatus comprising:

(i) a substrate-supporting surface having a concave portion including a depression slanting toward the center of the substrate-supporting surface, wherein only a peripheral portion of the back surface of the substrate, when loaded, contacts the slanting surface of the concave portion;

(ii) a heating element; and

(iii) no mechanical mechanism to clamp the substrate on the substrate-supporting surface.

11. The apparatus as claimed in Claim 10, wherein said slanting surface is a portion of a spherical surface.

12. The apparatus as claimed in Claim 10, wherein said slanting surface is a conical surface.

13. The apparatus as claimed in Claim 10, wherein said concave surface comprises a slanting portion and a flat portion.

14. The apparatus as claimed in Claim 10, wherein the distance between the back surface of the substrate and the center of the concave surface is 0.05mm to 0.3mm.

15. The apparatus as claimed in Claim 10, wherein the heating element is embedded below said concave portion.

16. The apparatus as claimed in Claim 15, wherein said substrate-supporting apparatus further comprises a radio-frequency electrode of a metal element embedded below said concave portion and above said heating element.

17. The apparatus as claimed in Claim 10, wherein said substrate-supporting apparatus further comprises a surface peripheral portion formed outside the substrate-supporting surface, said surface peripheral portion having a lip portion which protrudes in a ring shape.

18. A method of treating a semiconductor substrate, using the plasma CVD apparatus of Claim 10, comprising the steps of:

loading a substrate on the substrate-supporting surface;
evacuating the vacuum-pumped reaction chamber;

heating the substrate-supporting apparatus; and

forming a film on the substrate at a pressure of 3-10 Torr, wherein the substrate is uniformly heated by heat conduction from the periphery of the substrate and by convection heat and radiation heat from the back of the substrate.

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19. The method as claimed in Claim 18, wherein the heating element is controlled at a temperature of 300-650°C.

20. The method as claimed in Claim 18, wherein an electrode is embedded under the substrate-supporting surface and causes a plasma discharge.